

# Existing Works — Restoration

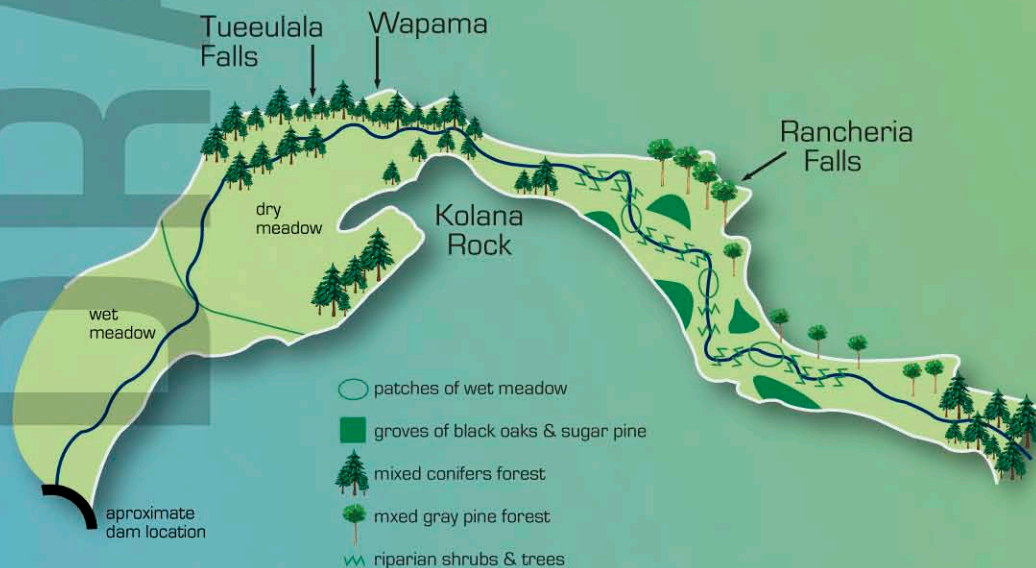
		Year	1987	1988	1988	1988	2004	2004	2004
Category	Component	U.S. Bureau of Reclamation (USBR)	U.S. Department of Energy (DOE)	Assembly Office of Research (AOR)	National Park Service (NPS)	University of California, Davis (UCD)	Environmental Defense (ED)	University of California, Berkeley (UCB)	
General Restoration Issues	Timeline for restoration			✓	✓				
	Restoration scenarios				✓				
Vegetation	Dealing with non-native species				✓				
	Collection of seeds and propagation of plants			✓	✓				
	Restoration of plants				✓				
Intervention for recovery of some species	Effects to existing species				✓				
	Restoration of mammals				✓				
	Restoration of bird species				✓				
	Restoration of reptiles and amphibians				✓				
Other species	Insects				✓				
	Soil organisms				✓				
Physical effects	Remaining ground disturbance from dam building	✓		✓	✓				
Dam Removal	Financial Costs of dam removal								
	Logistics of dam removal								
Cost estimates for restoration									

Note: Check mark does not mean information is adequate, only that some discussion or information is available.

# Restoration

Restoration Alternatives		Restoration without Management	Restoration with Moderate Management	Restoration with Intensive Management
Category	Component			
Vegetation	Expect abundance of non-native herbaceous species	✓	✓	✓
	Expect successful restoration of herbaceous species <sup>1</sup>	✓	✓	✓
	Expect successful restoration of shrub species <sup>1</sup>	✓	✓	✓
	Expect successful restoration of tree species <sup>1</sup>	✓	✓	✓
	Plant distribution similar to pre-dam conditions (at 50 years)	✓	✓	✓
	Control of exotics	✓	✓	✓
	Seed collection and plant propagation	✓	✓	✓
Wildlife	Expect successful restoration of all mammal species	?	✓	✓
	Expect successful restoration of all bird species	?	✓	✓
	Expect successful restoration of all reptiles and amphibians	?	✓	✓
Other species	Expect successful restoration of insect species	✓	✓	✓
	Expect successful restoration of soil organisms	✓	✓	✓
	Expect successful restoration of aquatic organisms	✓	✓	✓
Physical effects	Time for disappearance of "bathtub ring"	80-120 yrs	80-120 yrs	80-120 yrs
	Expect successful restoration of natural hydrology	✓	✓	✓
	Remove traces of ground disturbance from dam building	?	✓	✓
Monitoring effort during restoration		✓	✓	✓
Cost estimates for restoration		low	medium	high

1/ Successful restoration of plants means both distribution and diversity of species are similar to conditions in the valley prior to construction of O'Shaughnessy dam.



all open areas in upper valley are dry meadows with scattered oaks & conifers

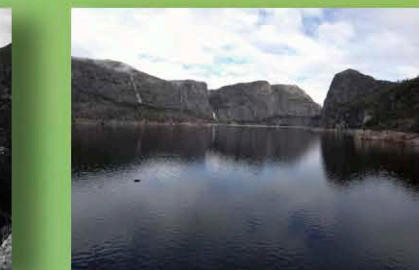
## Comparison of three restoration scenarios as described in NPS 1988

Scenarios	Comparison Criteria			
	Management activities of restoration	Expected vegetation response	Expected wildlife response	Monitoring
Restoration without Management	Possible regrading of valley floor. Manual monitoring. Tall fire suppression.	Rapid invasion of non-natives. Dense stands of seedling seedlings, with survival dependent upon precipitation. Tree establishment sporadic. Few black oaks. Native herbaceous plants may dominate only in wetter meadow areas. Slow regeneration of riparian and shrub species. Forested areas dense. Distribution and abundance of species not similar to pre-dam conditions. Fire suppression would lead to eventual succession of meadow to forest.	Deer and bear use expected primarily in spring until about year 30, when they would use the valley in other seasons. Deer browsing will suppress growth of some shrubs. Small mammals, reptiles and amphibians expected to recolonize within 5 years. Some species may recolonize slowly or not at all, and this would be unknown due to lack of monitoring. Mammalian predators and bird species are highly mobile and so expected to recolonize quickly. Most natives expected to recolonize though distribution and diversity would probably be different than pre-dam conditions.	Photo points for vegetation response. Wildlife sampling with live stations, live traps and calls. Anecdotal observations by NPS personnel.
Restoration with Moderate Management	Regrading of valley floor to pre-dam construction contours and elevations. 5 years of seed collection and plant propagation. Annually, 5-10% of exposed land revegetated. Development of map of pre-dam plant communities. Protective fencing placed on new plantings. No suppression of non-native plants and no watering of plantings. Prescribed burning. Monitoring of restoration success. Possible translocation of species or captive breeding.	Plantings of native vegetation throughout valley, which successfully compete with non-natives. Dense stands of conifers, in areas similar to those that occurred pre-dam. Tree establishment fairly successful. Some planted black oaks. Native herbaceous plants dominate in many areas. Moderate regeneration of riparian and shrub species. Forested areas open and limited due to use of prescribed burning. Distribution and abundance of species similar to pre-dam conditions.	Deer and bear use expected primarily in spring until about year 20, when they would use the valley in other seasons. Deer browsing would be controlled with exclosures around sensitive plantings. Small mammals, reptiles and amphibians expected to recolonize within 5 years. Some species may recolonize slowly or not at all, but this would be detected by monitoring and efforts undertaken to assist in recolonization. Mammalian predators and bird species are highly mobile and so expected to recolonize quickly. Most natives expected to recolonize and distribution and diversity would be similar to pre-dam conditions.	Monitoring of planting success including annual monitoring of survival and vigor of transplants and qualitative assessment of seed germination rates and seedling survival. Estimation of plant composition of all major plant communities. Photo points. Wildlife monitoring would determine presence/absence of most endemic and exotic species, identify over-utilization of selected vegetation, identify suppression of prey species by predators, identify plant species suppressed by exotics. Sampling would determine immigration rates, reproductive success, population trends, food habits and habitat use.
Restoration with Intensive Management	Regrading of valley floor to pre-dam construction contours and elevations. 5 years of seed collection and plant propagation. Annually, 10-20% of exposed land revegetated. Development of large-scale and detailed map of pre-dam plant communities. Protective fencing placed on new plantings. Planting continued indefinitely. Active suppression of non-native plants. Prescribed burning. Intensive monitoring of restoration success. Possible translocation of species or captive breeding.	Abundant plantings of native vegetation throughout valley, which successfully compete with non-natives. Tall stands of conifer seedlings, in same areas as they occurred pre-dam, due to strategic placement and post-planting care such as watering and protection. Stands of planted black oaks. Native herbaceous and shrub species dominate in most areas. Good regeneration of riparian and shrub species. Forested areas open and limited due to use of prescribed burning. Distribution and abundance of species very similar to pre-dam conditions.	Deer and bear use expected primarily in spring until about year 15, when they would use the valley in other seasons. Plant browsing would be controlled with exclosures around sensitive plantings. Small mammals, reptiles and amphibians expected to recolonize quickly. Some species may recolonize more slowly, but this would be detected by monitoring and efforts undertaken to assist in recolonization. Mammalian predators and bird species are highly mobile and so expected to recolonize quickly. Most natives expected to recolonize and distribution and diversity would be very similar to pre-dam conditions.	Monitoring would be similar to that in Moderate Management scenario, but more intense. Monitoring of planting success including annual monitoring of survival and vigor of transplants and qualitative assessment of seed germination rates and seedling survival. Estimation of plant composition of all major plant communities. Photo points. Wildlife monitoring would determine presence/absence of most endemic and exotic species, identify over-utilization of selected vegetation, identify suppression of prey species by predators, identify plant species suppressed by exotics. Sampling would determine immigration rates, reproductive success, population trends, food habits and habitat use.

\* All information is from NPS document.



Hetch Hetchy Valley Before Construction  
Photographer Unknown



Hetch Hetchy Valley, 2005  
Photo: Dale Kolka, DWR

THE HETCH HETCHY STUDY



THE RESOURCES AGENCY  
DEPARTMENT OF WATER RESOURCES  
DEPARTMENT OF PARKS AND RECREATION